

What is claimed is:

1 1. A method for analyzing an integrated circuit die having a back side opposite
2 circuitry at a circuit side and having a liquid crystal layer formed over a portion of the
3 die, the method comprising:
4 directing near infrared (nIR) laser light at circuitry in the die via the liquid
5 crystal layer and generating heat at the circuitry; and
6 detecting a defect in the die by detecting a portion of the liquid crystal changing
7 phase.

1 2. The method of claim 1, further comprising operating a circuit portion in the die
2 near a failure condition, wherein directing nIR laser light at circuitry in the die includes
3 adding enough heat to the circuit portion to cause the liquid crystal over the circuit
4 portion to change phase.

1 3. The method of claim 2, wherein operating the circuit portion includes generating
2 enough heat at the circuit portion to cause the liquid crystal over the circuit portion to
3 approach a threshold temperature at which the liquid crystal changes phase and wherein
4 adding enough heat to the circuit portion with the nIR laser light includes causing the
5 liquid crystal to reach the threshold temperature and change phase.

1 4. The method of claim 2, wherein operating the circuit portion includes operating
2 the die in a continuous loop at a near failure condition.

1 5. The method of claim 1, wherein generating heat at the circuitry with the nIR
2 laser light includes causing the circuitry to absorb laser radiation.

1 6. The method of claim 5, wherein causing the circuitry to absorb laser radiation
2 includes causing the circuitry to absorb at least one of: free carriers and phonons.

1 7. The method of claim 1, further comprising using the nIR laser light to image the
2 die and using the image to identify the portion of circuitry that causes the liquid crystal
3 to change phase.

1 8. The method of claim 1, further comprising using the nIR laser light to image the
2 die and using the image to identify a circuit portion for analysis, wherein directing the
3 nIR laser light at circuitry includes directing the laser light to the identified circuit
4 portion.

1 9. The method of claim 1, wherein generating heat at the circuitry includes using
2 silicon in the die to convert light energy from the laser into heat energy.

1 10. The method of claim 1, wherein directing nIR light at the circuitry includes
2 using a near infrared (nIR) scanning optical microscope (SOM) to scan the die with a
3 laser beam.

1 11. The method of claim 1, wherein the integrated circuit die includes a flip chip die
2 having a thinned region in the back side and having the liquid crystal layer formed over
3 the thinned region, wherein directing the nIR laser at circuitry in the die includes
4 directing the nIR laser at circuitry via the thinned back side.

1 12. The method of claim 1, wherein directing nIR laser light includes directing laser
2 light having a wavelength of about 1.3 microns.

1 13. The method of claim 1, wherein directing nIR laser light includes raster
2 scanning the nIR laser light across the die.

1 14. The method of claim 1, wherein detecting a portion of the liquid crystal
2 changing phase includes using the nIR laser light to image the liquid crystal and using
3 the image to detect the portion of the liquid crystal changing phase.

1 15. The method of claim 14, wherein using the nIR laser light to image the liquid
2 crystal includes taking a plurality of images of the liquid crystal and averaging the
3 images.

1 16. The method of claim 14, wherein detecting a defect in the die includes
2 overlaying the image of the liquid crystal onto an image of the die circuitry and
3 matching the portion of the liquid crystal changing phase to a defective circuit portion
4 in the die.

1 17. The method of claim 1, further comprising removing an amount of substrate
2 from the die that makes possible heat transfer from the circuitry to the liquid crystal in a
3 manner that causes a portion of the liquid crystal to reach a temperature near its
4 threshold temperature for changing phase, wherein the liquid crystal is formed over the
5 die after the substrate removal.

1 18. The method of claim 1, wherein directing nIR laser light includes varying the
2 operation of an nIR laser.

1 19. The method of claim 18, wherein varying the operation of the nIR laser includes
2 pulsing the laser.

1 20. A system for analyzing an integrated circuit die having a back side opposite
2 circuitry at a circuit side and having a liquid crystal layer formed over a portion of the
3 die, the system comprising:
4 means for directing nIR laser light at circuitry in the die via the liquid crystal
5 layer and generating heat at the circuitry; and
6 means for detecting a defect in the die by detecting a portion of the liquid crystal
7 changing phase.

1 21. A system for analyzing an integrated circuit die having a back side opposite
2 circuitry at a circuit side and having a liquid crystal layer formed over a portion of the
3 die, the system comprising:

4 a laser source adapted to direct near infrared (nIR) laser light at circuitry in the
5 die via the liquid crystal layer and generate heat at the circuitry; and

6 a detection arrangement adapted to detect a defect in the die by detecting a
7 portion of the liquid crystal changing phase.

1 22. The system of claim 21, wherein the laser source includes a near infrared
2 scanning optical microscope (nIR SOM).

1 23. The system of claim 22, wherein the detection arrangement includes the nIR
2 SOM and is adapted to detect an image of a portion of the liquid crystal having changed
3 phase.

1 24. The system of claim 23, wherein the nIR SOM is adapted to detect images of the
2 liquid crystal over time and to generate an image of a portion of the liquid crystal
3 having undergone a phase change as an average of the liquid crystal images.